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## Ontario Dairy Research and Services Committee Report

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### EXECUTIVE SUMMARY

The ODRSC held its annual meeting on September 16, 1998. Because of several new members and proposed modification of OMAFRA coordination of research in Ontario, the Committee spent some time reviewing the mandate of the Committee, ARIIO, OASCC and OARSC. The Committee decided to focus on research priorities and include service issues elsewhere in the report. Communication of research findings for adoption by Ontario dairy producers continues to be a concern of the industry. Research priorities remain similar to 1997. Nutritional strategies and reproduction efficiency continue as the top two priorities. Each of the eight research priorities has been edited and often additional details/objectives added. Industry members stressed the importance of funding research that is relevant to Ontario, while at the same time supporting basic research in selected areas of specialization. The Committee discussed the priority of molecular genetics at some length and decided to support

the addition of cloning to the details in the reproductive efficiency priority. The dairy industry continues to consolidate to fewer farms that are larger and produce more milk.

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## **INTRODUCTION**

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The Ontario Dairy Research and Services Committee is made up of representatives from all interested stake holders. Meetings are held annually to review the state of the industry, identify emerging and outstanding issues and set research priorities. This report summarizes the 1998 meeting. Included in the report is a report on action taken on the previous year's recommendations, Committee membership list and an inventory of person-years dedicated to dairy research in Ontario. The 1998 ODRSC list of research priorities emphasizes projects needing additional research. It's recognized that, because there is no additional government funding, some projects will not receive funding and some existing projects may receive less funding if new research is to be initiated. Cooperative research efforts with NGO's and industry should be encouraged. The Committee wishes to acknowledge and thank the Dairy Farmers of Ontario for their recent creation of the DFO Research Fund. This is an excellent example of industry taking a lead role in supporting the research that will help determine the future of the industry.

The Animal Research Program was reviewed by ARIO in 1997 and a four year plan for 1998-2001 submitted. With the next ARIO review in 2001, the Committee will meet and prepare annual reports working towards the next review.

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## **COMMITTEE ACTIVITIES**

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The ODRSC held its annual meeting in Guelph at OMAFRA Head Office on September 16, 1998. Several new members have been appointed by their respective organizations. Mr. Leo Brisson and Mr. Hans Vink, from DFO are replacing Paul Henderson and Grant MacLaren. Dr. Alan Vaage is replacing Dr. Dick Welton from the Ontario Grain and Feed Association.

Paul Norris, OMAFRA is replacing Beth Wheeler, former Chair of the Committee. The Committee welcomes these new members and wishes to thank those retiring members for their contributions the past four years.

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## STATE OF THE DAIRY INDUSTRY

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### Global Overview

Ontario's dairy industry continues its constant evolution within the global business environment. Trade liberalization, fluctuating currency values and changing supply and demand outlooks are all having noticeable effects on Ontario's dairy producers.

Near-record corn and soybean crops in North America have contributed to lower grain and feed prices. Most parts of the province have enjoyed an ideal growing season and feed supplies are abundant.

For the second year in a row, the value of Canadian dairy product exports has exceeded the value of cattle, semen and embryos exported. Indeed, Ontario's milk productions during the 1997-98 dairy year was approximately 110% of domestic demand (compared to 103% a year earlier). Total production in Ontario climbed by 100 million litres over the preceding period, despite declining herd and cow numbers.

It is obvious that today's dairy producer has a greater exposure to the risks of fluctuating foreign markets. Shifting currency values, changing trade rules, new disease outbreaks, political unrest, economic downturns are all phenomena that, when they occur in the countries with whom we trade, can have significant consequences on the industry here in Ontario. These impacts can be positive as well as negative. This volatility generates a need for a well balanced research program. The benefits of research are not accessible to producers unless a strong extension service is closely linked to the research effort.

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### Economic Assessment

Milk continues to be first among commodities when ranked by value of farm cash receipts. The most recent data (1965) from the Ontario Farm Management Analysis Project (OMAFRA Publication '69) shows that the gap between top, average and low groups when ranked by net farm income (NFI) continues to widen. Among 297 dairy farms summarized, the top 99 had NFI of \$109,010, compared to the average of \$56,671 and \$12,630 for the lowest 99 farms.

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### Herd and Farm Profile

In August of 1998, 7,120 producers sold milk to Dairy Farmers of Ontario (DFO) compared to 7,458 a year earlier. Stronger dairy cattle sales to the U.S. have contributed to a decline in cow numbers during the year. Ontario DHI statistics show that milk production per cow climbed by 57 kgs per cow during 1997, while butterfat declined by 3 kgs and protein increased by 2 kgs. Average production in Ontario milk recorded herds is now 8,070 kgs of milk, 290 kgs of butterfat and 249 kgs of protein, with an average somatic cell count of 238,000. Sixty-six percent of herds in the Province are on some form of milk recording, and increase of 1% over a year earlier.

New dairy barn construction continues in Ontario, new facilities are predominantly free-stall barns with bunk silos and in some cases, commodity sheds. An increasing number of these new facilities feature sand bedded free-stalls. Tower silos equipped with high capacity unloaders are also regaining popularity.

A new technique being employed by some producers this year is

kernel "processing" of corn silage. A field unit chops and crushes the silage before it is stored. After fermentation is complete, "processed" silage is more digestible than regular silage. Trials have shown that "processed" silage can increase milk production by 0.75 to 1.25 kgs per cow per day.

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### **Milk Marketing Conditions**

August 1, 1998 marks one year under the daily quota system. Earlier during the year, Ontario pulled out of the inter-provincial quota exchange with Quebec and Nova Scotia, after 2 percent of the Province's quota was sold outside Ontario. Quota prices have since dropped approximately 15%, partly due to the aforementioned pullout, but also because of a 1.5% increase in the amount of quota issued.

The U.S. and New Zealand have now joined to mount a WTO challenge to Canada's special class pricing system for milk. The controversial issue of butteroil\sugar blend imports was referred to the Canadian International Trade Tribunal (CITT) for identification of possible courses of action. The potential loss of income to Canadian producers due to blend imports ranges from \$25 to 64 million annually.

Average Provincial component tests have declined marginally during 1998. In July of 1998 butterfat and protein tests averaged 3.74% and 3.20% respectively, compared to 3.79% and 3.26% respectively in June of 1997.

Component prices for within quota shipments during July of 1998 were as follows: (August 1997 figures in Brackets) Butterfat: \$5.26/kg (\$5.15), Protein: \$8.81/kg (\$8.39), Other solids: \$1.23 (\$1.18)

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## **EMERGING NEEDS AND OUTSTANDING ISSUES**

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### **1. Research Technology Transfer**

There is an ongoing need to improve transfer of research results to the industry/producer. It is recognized that significant changes are underway in OMAFRA and Ag Canada to address this issue. These changes as detailed in the responses to 1997 ODRSC recommendations appear to be moving in the right direction. ODRSC supports the endeavors undertaken by the Canadian Dairy Extension Committee (CDEC) and OMAFRA dairy lead positions.

### **2. Disease Monitoring And Diagnostics**

Although not an issue with every dairyman, there are diseases that require monitoring and developing of accurate, rapid diagnostic techniques. An example cited is Johne's Disease. No testing is routinely done in Ontario, incidence may be as high as 10% and it may impact on export sales of breeding stock.

### **3. Dairy Research Funding**

Funding in support of dairy research needs to increase. Matching funds from industry and the new DFO research fund are encouraging and appreciated, but this is not enough to support the basic research programs.

#### **4. Consumer Acceptance of Biotechnology**

Implementation of a strategy is required that will improve consumer acceptance of new biotechnology as it develops. For example, BST has met resistance in Canada and other bio-technologies, such as molecular genetics, might receive a similar reception and leave us less competitive in the marketplace.

5. Quality assurance of milk and meat from dairy animals is attracting continued attention. Programs at the producer, processor and consumer level need to be implemented to reduce the incidence of food borne pathogens such as E.coli 0157:H7, Salmonella sp. and Campylobacter. Antibiotic resistance is an increasing concern that will ultimately impact on the use of antibiotics in animal and poultry production systems. The BSE - Mad Cow Disease is still an issue and the dairy industry needs to be cautious when much of the cull cow market ends up in the hamburger chain.

#### **6. Prescriptions For Feed Additives**

Concern was raised over the level of some mineral elements and feed additives being prescribed for dairy ration supplements. Of particular concern to the feed industry were levels of selenium and rumensin being mixed based on veterinary prescription. It was also suggested that some other mineral levels were much higher than levels recommended by NRC and this may be having a negative impact on reproduction and health.

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### **REPORT OF ACTION TAKEN ON 1997 RECOMMENDATIONS**

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#### **RECOMMENDATION #1**

**Priority 1-B**

**TO: ARIO, CARC, U OF G, OMAFRA**

To define cow nutrient requirements during stressful periods such as transition, early lactation and peak production. To research nutritional and feeding strategies that reduce feed cost and directly impact the production of milk components of high economic value, without compromising health, reproduction or milk quality.

#### **RESPONSE:**

##### **ARIO**

To ensure cost effective operations, producers must be able to implement practices that maximize health, nutrition and reproduction. These practices must incorporate current knowledge that is applicable to today's production systems. Objective 4 ("To continue support for multidisciplinary research into determinants of dairy farm profitability in Ontario:") of the 1997-2001 approved dairy research program addresses this recommendation through work that can be done to support the Decision Support System project for Ontario dairy herds. Research that can be done for this project will measure the associations between health, disease, reproduction, genetics,



production and dairy enterprise profitability. Nutrition research is supported through work that can be done under Objective 2 of the approved 1997-2001 dairy research program ("To investigate nutritional and feeding strategies which improve profitability, in view of increased costs of feed and other inputs").

### UNIVERSITY OF GUELPH

The recommendations concerning Dairy to define nutrient requirements during stressful periods such as transition, early lactation and peak production; reduce feed costs without comprising health, reproduction or milk quality are being addressed in 1998/99 by the following research projects:

Project #	Leader	Title
18770	Duffield, T.	Evaluation of prevention treatment and diagnostic strategies for retained placenta and metritis and their subsequent impact on reproductive performance in lactating dairy cattle.
15250	Grovum, L.	Managing high producing cows to avoid ruminal acidosis.
16320	Leslie, K.	Effect of moxidectin pour-on treatment prior to calving on measures of health and performance in dairy cattle.
18850	Mallard, B.	Mechanism(s) of immunomodulation by organic chromium (III) in peripartum dairy cows: Impacts on health and performance of the cows & calf.
18860	Mallard, B.	Genetic regulation of immune responses during the periparturient period and associations with health and performance of Holstein cows.
18830	McKnight, D.	Effect of probiotic/yeast supplement on performance of transition Holstein cows.
17720	Osborne, V.	Water and feed nutrition of the periparturient and early postparturient dairy cow.
16280	Walton, J.	Endocrine regulation of early pregnancy in cattle.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

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### RECOMMENDATIONS #2

### Priority 1-B

#### TO: ARIO, CARC, U of G, OMAFRA, AAFC

To support research to increase the reproduction efficiency of dairy animals that will elucidate factors affecting reproduction in the high producing cow. To conduct a cost benefit analysis of the application, economic potential, conduct and acceptance of research in dairy molecular genetics.

#### RESPONSE:

**ARIO**

Reproductive studies and the application of results will assist in maintaining and enhancing the competitiveness of the Ontario dairy industry by reducing calving intervals, increasing the reproductive life of the cow and operating on a cost effective basis. The 1997-2001 approved dairy research program contains two objectives directed at dairy genetics. Objective 3 pertains to the "validation, verification and upgrade of the genetic evaluation system for cows and bulls in Ontario" while Objective 5 deals with "support for research to increase the reproductive efficiency of dairy animals". Work can be done in these areas that should assist in addressing the above recommendation.

**UNIVERSITY OF GUELPH**

The recommendations concerning Dairy to Increase the Reproductive Efficiency are being addressed in 1998/99 by the following research projects:

Project #	Leader	Title
16860	Gentry, P.	Function of proteinase-type proteins in regulation of ovarian follicular development in dairy cows.
15220	Hahnel, A.	Comparison of alkaline phosphatase gene expression in preattachment bovine embryos derived in vitro and in vivo in order to increase in vitro efficiencies.
18779	Duffied, T.	Evaluation of prevention, treatment and diagnostic strategies for retained placenta and metritis and their subsequent impact on reproduction performance in lactating dairy cattle.
15200	Walton, J.	Programmed breeding of dairy cows.
16280	Walton, J.	Endocrine regulation of early pregnancy in cattle.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

**AAFC**

Technologies for programmed breeding presently available in the beef sector should be adapted to the dairy production. Some of the stresses associated with the delay in post-partum return to oestrus should be identified and then ways should be developed to minimize these, so an improvement of the reproductive processes can be expected.

The research team on reproductive physiology at Laval University is doing some work on embryo transfer, in vitro fertilization and cryopreservation. Collaborative ventures with this team should yield benefits and help solve some of the problems. A cost benefit analysis of molecular genetics is not really required.

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**RECOMMENDATIONS #3****Priority 1-B****TO: ARIO, CARC, U OF G, OMAFRA**



To increase the awareness of dairy research in Ontario and to improve the communication network of research results for technology adoption by Ontario dairy producers.

#### **RESPONSE:**

##### **ARIO**

This non-research recommendation has been forwarded to both the Agriculture and Rural Division and the Education, Research & Laboratories Division of OMAFRA for response.

##### **EDUCATION, RESEARCH & LABORATORIES DIVISION**

As part of the enhanced Partnership Agreement between OMAFRA and the University of Guelph, a Technology Transfer Committee has been created to formulate processes to improve the transfer of research findings to the ARD Program Leads and other extension workers. This committee is chaired by Marc Le Maguer, Director of OMAFRA Research Programs and has representatives from the University, GFTC, OMAFRA's FID, ARD and ERLD.

The Research Analysts in ERLD have a role to network with the Program Leads in ARD, Client Account Officers in FID and others in the Ministry to find out their information needs relative to research results and to explore mechanisms to improve the communication of new technology.

Another part of the Research Analysts' roles is to provide information to the committees of OASCC on the current research activities as it relates to the committee priorities. The information will be provided as frequently as the Committee needs it for its deliberations. It is not the role of the ODRSC to participate formally in the allocation of research funding. However, the ODRSC is invited to participate in the ARIO review of OMAFRA funded research and members of DRSC are also members of the project review committees at the University of Guelph.

The review of the research coordination process is underway with the results of this review and recommendations for change to be released in the Fall of 1998.

The funding allocation for research is constantly under review and ways to increase flexibility in order to attract industry support, better focus on industry needs or attack emerging issues are being investigated. The other major players in dairy research besides OMAFRA is AAFC and the MOU between and AAFC, which describes their respective rolls, is presently being updated to reflect the recent changes. In this way, there should be no unnecessary duplication of research. OMAFRA does fund long term research and ARIO looks for a mix of basic and applied research when reviewing research programs.

##### **UNIVERSITY OF GUELPH**

The recommendations concerning Dairy to increase the awareness of dairy research in Ontario and to improve the communication network of research results for technology adoption by Ontario dairy producers are being addressed in 1998-99 by the following research projects.

##### ***Little to no action at this date***

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

##### **OMAFRA**

1. A complete set of printed resources used in the delivery of dairy extension in New York State under the banner of Pro-Dairy has been obtained for review. Following a complete review, an assessment will be made as to what follow-up is appropriate with staff that develop and deliver the Pro-Dairy Program. This review will be conducted by the dairy program leads that will be put in place in the Agriculture and Rural Division during July of 1998.
2. There currently are three initiatives that will lead to improved communication of dairy research results to industry, government staff and producers.
  - a) The Agricultural and Rural Division is currently filling four dairy lead positions. The leads will work closely with researchers to ensure that research findings are assessed, packaged and delivered to industry staff, OMAFRA personnel, producer groups and individuals. Speeding up the transfer of appropriate research findings for quick implementation will help keep our dairy industry participants performing on the cutting edge of technology.
  - b) The Ministry has used the dairy sector as a pilot for the implementation of Internet technology in agriculture. The Agriculture and Rural Advisory Services Study endorsed further developments in Internet programs for the agriculture and rural sectors. Ministry staff have been participating on a committee with various partners in the dairy industry to look at enhancing Internet communication of dairy information through the development of a "Ontario Dairy Site" that could be used to quickly access information resident on the various partners' home site. It is anticipated that this cooperative approach to the use of this powerful communications method will provide any users of the new site with quick access to research findings and recommendations from reliable sources in the industry.
  - c) The Ministry is also active with number of industry partners to set-up a process whereby different players in the industry meet to discuss industry needs, issues and opportunities. The group will eventually identify priority areas for awareness and educational activities directed towards producers and representatives from industry and government. It will be important to identify who will develop/deliver particular dairy information programs and who should be promoting programs being put on by other partners. This process, which will be initiated in late summer 1998, will help focus industry partners on industry needs, avoid duplication of efforts and ensure that key needs are not inadvertently missed.
3. The Education, Research and Laboratories Division needs to continue to work with the Agricultural Research Institute of Ontario (ARIO) and the University of Guelph to enhance the communication of the research projects that are ongoing and planned. ARIO does use the ODRSC priorities as one of the criteria for allotting funds to dairy research proposals. The ERLD and the ARIO would have to consider the pros and cons of formally involving the ODRSC in the allotting of dairy research funds.
4. The Education, Research & Laboratories Division needs to take the lead at looking at "who does what" in dairy research. The Agriculture and Rural Division will be working with industry partners in addressing the overall plan for the delivery of dairy extension. The current activities in this area are outlined in section a, b and c of response number 2 above.
5. It would be appropriate for the ERLD and ARIO to initiate the suggested review of the different aspects mentioned in this recommendation. That group would determine if representation from other jurisdictions should be included. Representatives of the Agriculture and Rural Division would be pleased to participate in such a review if requested.

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### **CANADIAN DAIRY EXTENSION COMMITTEE (CCDEC)**

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A letter was received from Mr. Blair Murray, Secretary-treasurer, CDEC. It's contents are as follows:

Thank you for your letter of April 6, 1998 and the attached recommendation from the Ontario Animal Research and Services Committee. I certainly welcome the opportunity on behalf of the other CDED/CCVIL members to respond to the recommendation of the Dairy Subcommittee.

The CDED/CCVIL efforts and expertise have addressed a number of points in the Dairy Sub-committee recommendations. Point #3 and point #5 regarding OMAFRA funded research are not in our terms of reference.

Please find attached our Mission Statement as well as the Executive and Committee Members. The Committee started rather heavily weighted with Government representatives and over the years has become more representative of the cross section of the Dairy Industry from across Canada.

Projects of the CDEC/CCVIL have included: CDEC Newsletter, Dairy INFO Latere versions 1.0 and 2.0, Beef INFO Bovin and the Agri INFO web site and an industry discussion meeting on BST in 1997.

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### **WHAT CAN CDEC/CCVIL DO?**

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We have a strategically placed membership from many different aspects of the dairy industry across Canada.

We have extensive contacts through developing sources of information for the Dairy INFO program.

We are getting known across Canada for the "CD-ROM Projects". We have developed a skill base in development of multi-media material and information, publishing on paper and electronic media.

We can access federal and industry money for projects.

We are partially self sufficient through sales which are used to fund/cost recover revisions of the "INFO" publications.

We have developed a web site supported through industry partnership and the University of Guelph and on which we published approximately 900 articles in the past year.

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### **WHAT ARE THE PROBLEMS?**

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Loyalty and direction of staff time for people involved with the CDEC or Committee Projects lies with the provincial employers or the specific organizations for which the individuals work. When there is a

change in duties or money is tight the efforts for the common good disappear.

Provincial governments have the responsibility for extension but see their responsibility as applied only within their own provincial borders. They are unwilling to commit even small amounts of funds to any national effort in this regard. There is however no national agency with responsibility in this area. Because of this situation we believe there is a role for CDEC.

We have had some success at publishing newsletters but that has lapsed because we have relied totally on goodwill/in kind support.

It follows that we cannot do something for nothing ie cannot totally rely on in kind contributions. If we are to be more effective as information brokers, then we need to obtain some funds to have a staff member see that this aspect of the work is carried out consistently and continuously.

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### **WHAT WOULD WE DO FOR THE DAIRY INDUSTRY?**

We see our Committee as becoming increasingly active as information broker and a technology transfer clearing house.

Our emphasis is national, not provincial. National information sharing is important. I think in the long term this will benefit Ontario more than merely operating within the Ontario system. One of the benefits we see of our Committee is the ability to bridge provincial boundaries and limitations.

We have had discussions with Ms. Chantal Paul, communications officer with Dairy Farmers of Canada and Agriculture and Agri-Food Canada at Lennoxville about co-ordinating some of our efforts as much of these items fall within her terms of reference as well.

We would like to: Continue publishing a Newsletter both printed and by electronic media. We could publish on the web on our site, or CARC's web site, or whatever is perceived to be appropriate. Consider running a discussion group. Continue developing and producing national Infobases (eg. Dairy INFO Latiere) as a practical way of sharing and developing material jointly on a national basis.

#### **We would suggest that we could:**

- act as information brokers
- technology transfer clearing house
  - updates of ongoing projects
  - beginning extension projects
  - interim and progress reports
- publish/share this information in a variety of ways:
  - internet: our site on U of Guelph system
  - CARC site
  - some other address
  - paper newsletter(some still read hard copy)

I think this approach would finally help fulfil the technology transfer role suggested in the CARC system of Committees where there is mention of Services and tech transfer but they have been relatively ineffective to date.

We need some financial support to ensure we can produce a

communication vehicle such as a newsletter, electronic or otherwise. CARC support for 3 years for a person part time to co-ordinate and produce this effort would be appropriate. By that time, if we have done a professional job and there is indeed a demand we should be able to have direct industry support in the form of subscriptions, direct advertising, etc. continue on a self-supporting basis.

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## **SUMMARY**

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The Canadian Dairy Extension Committee (CDEC/CCVIL) has developed wide dairy industry contact through its membership from the various key representatives of whole industry and through the extensive network of Editorial Board associated with the Dairy INFO Latere projects. We have developed the most extensive resource in dairy technical publications in Canada and also have experience in information dissemination through the internet. We have not been as pro-active in promoting technology transfer in Canada (and Ontario) as we would want and is laid out in the OASCC recommendations of 1997. The goal of information broker or technology transfer clearing house is well within reach, however, we will need some revenue committed to consistently carry on this job.

We would be happy to discuss the ideas presented here with you or any or all of the Committees relating to Dairy or OASCC, attend a Committee meeting or whatever might be appropriate to further improvement of Technology Transfer in the Dairy industry.

Projects of the CDEC/CCVIL have included: CDEC Newsletter, Dairy INFO Latere versions 1.0 and 2.0, Beef INFO Bovin and the Agri INFO website and an industry discussion meeting on BST in 1997.

**Newsletter:** We published a newsletter circulated to our industry partners and any interested individuals. The intent was to circulate material specifically of interest and use to dairy technology transfer:

**Project reports, interim and final, applied research reports, summaries:** We wanted information written in a less formal manner than research reports, easier and quicker to produce and distribute that would be of practical use to those working in the industry.

The Newsletter was first edited and published quarterly by the Dairy Division of Alberta Agriculture, then the Dairy Development Division at AAFC. Changing priorities and demands on staff time meant each Department, respectively, found they could no longer commit time and resources to this cause. At that time, however, we did convert the newsletter to electronic format and published on the ACEIS site of Agriculture and Agri-Food Canada. Without an editor to take over, the effort died. As well publishing electronically, we lost contact with our mailing list we used with the paper version. We have not published a newsletter in the past 2 ½ years.

**Dairy INFO Latere:** This has turned into a great success. Version 2.0, a multi media CD-ROM, published in November of 1997 is on its way to selling out. It contains 600 publications from 22 different organizations across Canada. It is in every field office of OMAFRA as a staff resource. It is used by livestock staff of Manitoba Agriculture and BCMAFF and the field staff of Dairy Farmers of Ontario. We have an active editorial board from across Canada to contribute material and provide peer review. We are planning for Version 3.0 probably in early 1999.

**Beef INFO Bovin:** Version 1.0 similar to "Dairy" developed with the co-operation and support of OCA, CCA, OMAFRA and funding from



**CFBMC.**

**Agri INFO Website:** We have published a collection of 900 publications (Dairy and Beef Infobases) on the internet since May of 1997. They are fully searchable and published in their entirety except for video clips. The site has a large number of links and information about the Maple INFO project for which we are providing the technical expertise and publishing rights.

**Special Meetings:** The CDEC organized one Dairy Industry meeting in 1997 on rBST. The meeting consisted of 27 representatives of the major sectors of the Dairy Industry in Canada: Feed and Pharmaceuticals, Government (CFIA), Dairy Producers, Veterinarians, Dairy Producers, Consumers (Associations). There were discussion leaders from each sector to present their information and views. The opinion of all participants was that this was a very worthwhile exercise, especially as it crossed a lot of industry "sector" boundaries.

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**THE CANADIAN DAIRY EXTENSION COMMITTEE**

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**MISSION STATEMENT**

"The Canadian Dairy Extension Committee is committed to improving co-operative extension, liaison and communications among Canadian dairy industry to improve industry viability and competitiveness."

**OBJECTIVES**

1. To improve communications and understanding, as well as co-operative networks and partnerships, among individuals and organizations involved in dairy extension (dairy education, technology transfer, issue management and industry news) across Canada.
2. To access, evaluate, develop and disseminate dairy industry information more efficiently and effectively.
3. To maintain current reference listings of Canadian dairy extension resource personnel, information and factsheets.
4. To establish extension needs and priorities for the Canadian dairy industry in co-operation with all industry stakeholders.

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**CDEC/CCVIL EXECUTIVE & BOARD OF DIRECTORS**

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**RECOMMENDATIONS #4**

**Priority 1-B**

**TO: ARIQ, CARC, U OF G, OMAFRA**

To encourage research that identifies the epidemiology, efficacious preventive practices and cost effective treatment protocols for mastitis and other infectious diseases of economic importance in Ontario dairy herds.

#### **RESPONSE:**

##### **ARIO**

Mastitis is a significant factor in the quality of milk production in Ontario. The 1997-2001 approved dairy research program recognizes this through work that can be done under Objective 1 ("To encourage research which identifies the epidemiology, efficacious preventative practices and cost effective treatment protocols for environmental mastitis in Ontario dairy herds").

##### **UNIVERSITY OF GUELPH**

The recommendations concerning Dairy to encourage research that identifies the epidemiology, efficacious preventive practices and cost effective treatment protocols for mastitis and other infectious diseases of economic importance in Ontario dairy herds are being addressed in 1998/99 by the following research projects:

<b>Project #</b>	<b>Leader</b>	<b>Title</b>
16370	Jacobs, R.	Characterization of plasma factors blocking the expression of bovine leukemia virus.
16470	Jacobs, R.	Identification of genomic virulence markers in bovine viral diarrhea virus (BVDV) type II.
16350	Kelton, D.	Enhancing milk quality and udder health in Ontario through a sentinel dairy network.
15230	Leslie, K.	Evaluation of methods to eliminate and prevent intramammary infections in dairy cattle.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

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#### **RECOMMENDATION #5**

#### **Priority 1-B**

##### **TO: ARIO, CARC, U OF G, OMAFRA**

To conduct research that leads to improvement in dairy animal welfare or an increase in understanding of dairy cattle behavior.

#### **RESPONSE:**

##### **ARIO**

The welfare of livestock is of concern to the livestock industry due to the ethical concerns around animal production. Producers must be able to respond to these concerns in a factual manner. Objective 8 of the approved 1997-2001 dairy research program is specific to the welfare of dairy animals. Work that can be done under this objective will pertain to "research which will lead to improvement in dairy animal welfare or an increased understanding of dairy cattle behaviour".

**UNIVERSITY OF GUELPH**

The recommendations concerning Dairy to conduct research that leads to improvement in dairy animal welfare or an increase in understanding of dairy cattle behaviour are being addressed in 1998/99 by the following research projects:

Project #	Leader	Title
18750	Duncan, I.	The effects of tail docking on the welfare of dairy cows.
16390	McKnight, D.	The effects of alternative hutch housing on performance of dairy calves.
18820	McKnight, D.	Feasibility of using screened aged bark for animal bedding.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at : [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

**AAFC**

The Lennoxville team on animal behaviour is pursuing investigation on stress, behavioural reactions of animals to man and the relationship of stress to animal health and productivity. A constant focus must be maintained to assure that no deterioration takes place in the public perception of how animals are utilized in research and production systems.

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**RECOMMENDATION #6****Priority 1-B****TO: ARIO, CARC, U of G, OMAFRA, AAFC**

To support research to assess manure handling systems and milking center washwater to minimize environmental impact.

**RESPONSE:****ARIO**

It is the responsibility of the livestock industry to identify and implement management practices that will alleviate or minimize environmental impact. Of significance to the dairy industry is the management of manure and milk house washwater disposal. Through Objective 7 of the 1997-2001 approved dairy research program, work can be done to "assess manure handling systems and milking center washwater to minimize environmental impact".

**UNIVERSITY OF GUELPH**

The recommendations concerning Dairy to assess manure handling systems and milking center washwater to minimize environmental impact are being addressed in 1998-99 by the following research projects:

Project #	Leader	Title
16430	Sattar, S.A.	Sanitizing milk lines and milk handling equipment with special reference to rubber hoses gaskets and inflations.
18930	Weil, C.	Treatment of solid manure runoff and milkhouse wastewater.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

### AAFC

The Lennoxville Centre does not plan to pursue work on this type of investigations. Some of the research on pork manure processing may have some application to the dairy situation.

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### RECOMMENDATION #7

Priority 1-B

TO: ARIO, CARC, U of G, OMAFRA

To validate, verify and upgrade the genetic evaluation system for cows and bulls in Ontario.

#### RESPONSE:

##### ARIO

It is critical that genetic evaluation systems reflect current selection practices and production systems. Objective 3 of the 1997-2001 dairy research program specifically addresses this recommendation through work that can be done to "validate, verify and upgrade the genetic evaluation system for cows and bulls in Ontario".

##### UNIVERSITY OF GUELPH

The recommendations concerning Dairy to validate, verify and upgrade the genetic evaluation system for cows and bulls in Ontario are being addressed in 1998/99 by the following research projects:

Project # Leader Title  
16270 Schaeffer, L. Upgrading genetic evaluation systems for dairy cows and bulls in Ontario.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

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**RECOMMENDATION #8****Priority 1-B****TO: ARIO, U of G, OMAFRA, AAFC**

To continue support for multi-disciplinary research into determinants of dairy farm profitability in Ontario.

**RESPONSE:****ARIO**

To ensure cost effective operations, producers must be able to implement practices that maximize health, nutrition and reproduction. These practices must incorporate current knowledge that is applicable to today's production systems. Objective 4 ("To continue support for multi-disciplinary research into determinants of dairy farm profitability in Ontario") of the 1997-2001 approved dairy research program addresses this recommendation through work that can be done to support the Decision Support System project for Ontario dairy herds. Research that can be done for this project will measure the associations between health, disease, reproduction, genetics, production and dairy enterprise profitability.

**UNIVERSITY OF GUELPH**

The recommendations concerning Dairy to support for multi-disciplinary research into determinants of dairy farm profitability in Ontario are being addressed in 1998/99 by the following research projects:

Project #	Leader	Title
13570	Lissemore, K. A	decision support system for the Ontario dairy industry.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

**AAFC**

The research in identifying the determinant of dairy farm profitability can be done by systems analysis. When this is done, priorities should be set by the subcommittee to direct research in the identified area. The general support of multi-disciplinary research is an excellent wish to put forth and it is too encompassing to manage properly.

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**RECOMMENDATION #9****Priority 1-B****TO: ARIO, CARC, U of G, OMAFRA**

To support research into the assessment of low cost housing systems and their effects on profitability and the environment.

**RESPONSE:****ARIO**

The 1997-2001 approved dairy research program directly addresses the above recommendation through work that can be done under Objective 6 ("To support research into the assessment of low cost housing systems and their effects on profitability and the environment").

**UNIVERSITY OF GUELPH**

The recommendations concerning Dairy to assess low cost housing systems and their effects on profitability and the environment are being addressed in 1998/99 by the following research projects:

Project #	Leader	Title
16410	Clarke, S.	Investigation of installation cost and durability of four manger surfaces in a tie-stall dairy barn.
18870	Osborne, V.	Alternative feedstuffs environments and feeding strategies for newborn, weaned and growing dairy calves.
18920	Weil, C.	Emergency solutions to power outages for animal producers in Ontario.
16390	McKnight, D.	The effects of alternative hutch housing on performance of dairy calves.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at [www.uoguelph.ca/research/omafra/research\\_prog](http://www.uoguelph.ca/research/omafra/research_prog).

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**SUMMARY OF DISTRIBUTION OF 1997 RECOMMENDATIONS:**

Recommendation	AAFC	ARIO	OMAFRA	U of G	CARC	OTHER
1. National Strategies		X	X	X	X	
2. Reproduction Technology		X	X	X	X	X
3. Technology Transfer		X	X	X		CDEC
4. Infectious Diseases		X	X	X	X	
5. Dairy Animal Welfare	X	X	X	X	X	
6. Manure & Milk House Waste		X	X	X	X	X
7. Genetic Evaluation		X	X	X	X	X
8. Profitability	X	X	X	X		
9. Housing Systems		X	X	X	X	

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**1998 RESEARCH RECOMMENDATIONS****RECOMMENDATION #1****Priority 1-C****TO: U of G, OMAFRA, AAFC**

To define cow nutrient requirements during stressful periods such as transition, early lactation and peak production. To research nutritional and feeding strategies that reduce feed costs and directly impact the



production of milk components of high economic value, without compromising health, reproduction or milk quality.

#### **DETAILS:**

1. Nutritional studies of cows experiencing the stresses of calving, early lactation and high production, which circumvent reproductive and health problems should be conducted.
2. Research is needed to redefine the nutrient requirements of the modern cow during critical life stages such as transition and early lactation, while determining allowances for health and reproductive performance.
3. Research is required into "on farm" feeding systems comparing the impacts of single and multiple group TMR's and silage processing and the effects of by-product fibres on required fibre in rations to maintain animal health and desired milk component levels. Assessing the impacts of mineral levels formulated relative to NRC nutrients is an Ontario issue.

#### **BACKGROUND**

The interrelationship of production, health and reproduction in dairy cows is now better understood and yet little research is devoted to data collection and analysis of these variables simultaneously. Many nutrient requirements used in ration formulation today are based on production levels, management systems and research investigations of 20 or more years ago and may not reflect the nutrient needs of the cow today or in the future. There are also concerns related to the use of single group TMR's, silage processing effects on fibre levels and mineral levels fed relative to NRC requirements.

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#### **RECOMMENDATION #2**

**Priority 1-B**

**TO: AAFC, OMAFRA, U of G**

To support research to increase the reproductive efficiency of dairy animals that will elucidate factors affecting reproduction in the high producing cow. To conduct a cost benefit analysis of the application, economic potential, conduct and acceptance of research in dairy molecular genetics.

#### **DETAILS**

1. To refine the techniques for programmed breeding, especially with high producing cows.
2. To study oestrus detection, insemination times and techniques, especially as they relate to effects of nutritional, i.e. minerals and other stresses on ovarian function, reproduction and culling.
3. With additional funding, studies to collect oocytes, improve the success of in vitro fertilization and refine semen sexing, embryo splitting, cryopreservation and cloning techniques should be encouraged, in co-operation with federal researchers working in the same area of emphasis.
4. Research in molecular genetics is long term and expensive. It can provide a link to quantitative genetics and identify opportunities for producers to fill a niche market in the production of milk that has been genetically altered. It may be necessary to create a development position to examine this, as it is unclear as to whose mandate it is to conduct a cost benefit analysis of molecular genetics.

**BACKGROUND:**

Extended calving intervals and reduced longevity due to culling for reproductive failure are problems on Ontario dairy farms. The trend toward higher production levels puts additional pressure on the dairy producer to get cows pregnant. Research in other species has used molecular genetics to alter carcass quality and to reduce phosphorus excretion. Similar opportunities exist in dairy cattle research in molecular genetics. Since this research is long term and expensive, investigation of the opportunities for Ontario's dairy community to benefit from studying molecular genetics is necessary. Preliminary technology now exists to also consider cloning as a means of rapidly increasing the frequency of more desirable genotypes in the cow population.

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**RECOMMENDATION #3****Priority 1-C****TO: AAFC, U of G, OMAFRA**

To continue refining Canada's dairy sire and cow genetic evaluation systems.

**DETAILS:**

1. To test and validate variations to the current systems utilizing such approaches as the test day model to improve the repeatability of breeding value indices.
2. To determine the suitability of new technologies, such as gene markers in the refinement of dairy sire and cow evaluation systems.

**BACKGROUND:**

Dairy producers are using Canadian, US and internationally proven bulls in their breeding programs; however, even within the Canadian system for sire and cow genetic evaluation system there are some concerns as to whether or not particular situations are adequately accounted for in the calculations. In particular, those related to herd housing method and preferential handling of bull dams needs to be addressed. Changes to the systems to improve the repeatability of breeding values would be of significant value to the industry.

New technologies, such as gene markers, are emerging, which to date, have not been utilized in the current genetic evaluation system for sires and dams. The utilization of such information needs to be evaluated in terms of improving the repeatability and acceptance of genetic indices.

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#### **RECOMMENDATION #4**

**Priority 1-C**

**TO: AAFC, U of G, OMAFRA**

To encourage research that identifies the incidence, prevalence and impact of infectious diseases such as mastitis, abortion associated with Neospora and Papillomatous Digital Dermatitis, that will lead to the development of effective bio-security programs for Ontario dairy herds.

#### **BACKGROUND:**

Diseases caused by bacteria and viruses impact on productivity of Ontario dairy farms. Mastitis, measured by bulk tank and DHI SCCs, remains prevalent. Lowering SCCs remains a DFO priority. Adoption of recognized measures for control of contagious mastitis remains an issue for many farms. The identification and implementation of methods which effectively and economically prevent environmental mastitis remains a research priority.

Abortions associated with Neospora and lameness caused by Papillomatous Digital Dermatitis (Strawberry Foot) are increasingly reported in veterinary herd surveys and laboratory surveillance data. The extent and economic impact have yet to be documented. There is need for on-farm research into the patterns and the impact these diseases have in Ontario's dairy herd. Ongoing access to representative herds, for studies such as those being conducted on mastitis through the "Sentinel" project, is essential.

Ultimately, there is increasing evidence that producers and veterinarians need information on disease patterns and effective management strategies to protect dairy herds from infectious diseases and the use of this information to develop herd bio-security programs is a critical step.

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#### **RECOMMENDATION #5**

**Priority 1-B**

**TO: ARIO, CARC, U of G, OMAFRA**

To conduct research that leads to improvement in dairy animal welfare or an increase in understanding of dairy cattle behaviour.

#### **DETAILS:**

- New practices, such as tail docking may be questioned by the consumer. Research to address the need and effects of this practice and others, on cow health and behaviour are required.
- To study the effect of housing and other environmental factors on cow comfort, health and productivity. Specific to Ontario is the need to assess the impact of alternative free-stall and bedding sources.

#### **BACKGROUND:**

Animal welfare is one of the expanding socioeconomic issues that the dairy industry must face, but which traditional animal science disciplines are poorly equipped to handle. Initial concern for animal welfare issues in North America was prompted by European animal welfare legislation. Industry's interest in animal welfare will likely be driven by increasing concern about the image of the industry and a shift in consumer demand towards "green" farm produce. Research has now identified the widespread effects of stress on animal health and productivity. New dairy free-stall barns being constructed include a number of alternatives for free-stall bases and bedding alternatives. There is only limited scientific research data available comparing these alternatives.

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#### **RECOMMENDATION #6**

**Priority 1-B**

**TO: ARIO, CARC, U of G, OMAFRA**

To support research to assess the impact of dairy manure handling systems and milking center washwater treatment on dairy management systems and financial viability.

#### **DETAILS:**

To investigate the effects of various manure handling systems on animal and work health, costs and impact on the environment.

- To evaluate the effectiveness of non-traditional sanitizers such as peroxide on cleaning management and the environment.
- To evaluate the effectiveness of constructed wetlands or vegetative filter strips for treating runoff from exercise yards and milking center washwater.
- To investigate the impact of nutritional management to reduce manure levels

#### **BACKGROUND:**

The current collection, transfer and storage systems, used in free-stall housing require different management strategies to reduce environmental impact. Flush systems and manure separation are more common. More emphasis on nutrient management is required. Vegetative filter strips are being assessed for use in treating runoff and milking center washwater from smaller dairy farms. Alfred College has started some good work in these areas and should continue. Concern was also raised over the use of industrial

by-products as soil amendments and bedding sources.

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#### **RECOMMENDATION #7**

**Priority 1-B**

##### **TO: ARIO, CARC, U of G, OMAFRA**

To identify factors and develop decision support systems that impact profitability on dairy farms in Ontario.

##### **DETAILS:**

To identify and quantify the financial and biological factors that influence net farm income on Ontario dairy farms and to measure the association between health, reproduction, disease, genetics, production and dairy enterprise profitability.

- Support the adoption of DHI Dairy Comp 305 and subsequent analysis of inputted data for Ontario.

##### **BACKGROUND:**

The Ontario dairy industry must prepare itself for increased market competition given the inevitable reduction of current import tariffs on dairy products and the subsequent effect on our milk pricing system. Our dairies need to be able to quantify the production and economic efficiencies of their operations to identify their strengths and weaknesses. These must come before they can make the necessary strategic decisions that will ensure the long term viability of their farms. These decisions must be made with a knowledge of the biological and economic consequences of their actions. The type of analysis required to generate this information can only come from an integrated analysis of all aspects of the dairy enterprise. The current thrust to promote and utilize the DHI Dairy Comp 305 computer records program is fully supported.

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#### **RECOMMENDATION #8**

**Priority 1-B**

##### **TO: ARIO, CARC, U of G, OMAFRA**

To support research into the assessment of low cost housing systems and their effects on profitability and the environment.

##### **DETAILS:**

- To study factors that affect the cost and success of various housing systems for calves, replacement heifers, dry cows and milking cows.
- To investigate the environment in new greenhouse barns during all seasons of the year.
- To support on-farm comparison of housing and ventilation alternatives developed in other regions and countries for their uses in Ontario, especially low-cost alternatives.

##### **BACKGROUND:**

The trend to free stall housing continues in Ontario. New building and ventilation techniques attempt to combine least cost housing with optimal cow environment. Several new greenhouse barns have been built for both the housing of heifer calves and the housing of milking cows. An open front free stall barn has also been built. This new technology requires monitoring to assess benefits versus costs.

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## **ONTARIO DAIRY RESEARCH & SERVICES COMMITTEE MEMBERSHIP 1998**

---

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## **SAMPLE CODING OF RESEARCH**

There are many ways to identify and rank areas of research. The following samples uses a two-part code.

The first part identifies the priority of the research:

1. very important
2. important
3. desirable

The second is a letter to indicate the level of research in that topic:

- A. New topic, no know research (or external research, not applicable to Ontario)
- B. Expansion needed, some research underway
- C. Continue at existing level
- D. Decrease or discontinue

With each recommendation, state the priority level as 1,2, or 3 - A,B,C. or D. Therefore 1-A is the highest priority and 3-D the lowest. 1-C is a higher priority than 2-B.

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## **1998/99 DAIRY RESEARCH PROGRAM**

(Sorted by Objective and Goal)

Obj.	Goal	%	Project #	Leader	Title
<b>Sentinel Herds</b>					
1	1.1	100	16350	Kelton, D.	Enhancing milk quality and udder health in Ont. through a sentinel dairy network.
<b>Mastitis</b>					
1	1.2	100	15230	Leslie, K.	Evaluation of methods to eliminate and prevent intramammary infections in dairy cattle.
1	1.2	20	18790	Gibson, J.	Detection and utilization of Molecular Marker-QTL Associations in Dairy Cattle.
1	1.2	50	18850	Mallard, B.	Mechanism(s) of Immunomodulation by Organic Chromium (III) in Peripartum Dairy Cows: Impacts on Health and Performance of the Cow and Calf.
1	1.2	35	18860	Mallard, B.	Genetic Regulation of Immune Responses During the Periparturient Period and Associations with Health and performance of Holstein cows.
<b>Virology</b>					
1	1.3	40	18770	Duffield, T.	Evaluation of Prevention, Treatment and Diagnostic Strategies for Retained Placenta and Metritis and their Subsequent Impact on Reproductive Performance in Lactating Dairy Cattle.
Obj.	Goal	%	Project #	Leader	Title
<b>Nutritional Strategies/Milk Components</b>					
2	2.1	100	15250	Grovum, L.	Managing high producing cows to avoid ruminal acidosis.
2	2.1	100	16290	McBride, B.	Nutrition to promote health of the cow and to produce healthful dairy products.
1	2.1	100	16300	Cant, J.	Finding a description of milk synthesis adequate to manipulate milk composition Mechanism(s) of Immunomodulation by Organic Chromium (III) in Peripartum Dairy Cows.
2	2.1	50	18850	Mallard, B.	Impacts on Health and Performance of the Cow and Calf.
<b>Milk Urea Nitrogen</b>					

2	2.2	100	13650	Lissemore, K.	A study to evaluate the test characteristics of a milk urea nitrogen assay and its relationship to performance in the dairy cow.
2	2.2	40	18770	Duffield, T.	Evaluation of Prevention, Treatment and Diagnostic Strategies for Retained Placenta and Metritis and their Subsequent Impact on Reproductive Performance in Lactating Dairy Cattle.
2	2.2	20	18910	Sharpe, P.	Metabolism and Fertility in Dairy Cattle.
<b>Fiber Digestion</b>					
2	2.3	100	15240	Forsberg, C.	Role of adhesion in the mechanism of cellulose digestion by Fibrobacter succinogenes
2	2.3	100	16440	McKnight, D.	Animal feed from woodpulp combined biosolids
<b>Nutritional Management</b>					
2	2.4	100	16320	Leslie, K.	Effect of moxidecin pour-on treatment prior to calving on measures of health and performance in dairy cattle.
2	2.4	100	16460	Sharpe, P.	Pearl millet forage in cattle diets.
2	2.4	100	18830	McKnight, D.	Effect of a Probiotic/Yeast Supplement on Performance of Transition Holstein Cows.
2	2.4	100	18840	McKnight, D.	Effect of Silo Guard 1 on Preservation of Corn Silage
2	2.4	100	18870	Osborne, V.	Alternative Feedstuffs, Environments and Feeding Strategies for Newborn, Weaned and Growing Dairy Calves.
2	2.4	100	18880	Osborne, V.	Altering Water Quality and its Effect on Dairy Cow Performance and Oxidative Status.
2	2.4	100	18900	Sharpe, P.	Animal Performance on Sorghum and Pearl Millet.
<b>Obj.</b>	<b>Goal</b>	<b>%</b>	<b>Project #</b>	<b>Leader</b>	<b>Title</b>
<b>Genetic Evaluation</b>					
3	3.1	100	16270	Schaeffer, L.	Upgrading genetic evaluation systems for dairy cows and bulls in Ontario

3	3.1	70	16360	Schaeffer, L.	Genetic improvement of foot and leg disorders in dairy cattle.
3	3.1	50	18780	Gentry, P.	Genetic Evaluation of Factor X1 Deficiency in Holsteins and its Association with Reduced Reproductive Efficiency.
<b>Genotyping</b>					
3	3.3	100	13460	LaMarre, J.	Bovine lipoprotein receptors in mammary lipid metabolism.
3	3.3	100	16370	Jacobs, R.	Characterization of plasma factors blocking the expression of bovine leukemia virus.
3	3.3	80	18790	Gibson, J.	Detection and Utilization of Molecular Marker-QTL Associations in Dairy Cattle.
<b>Breeding Strategies (TREND)</b>					
3	3.4	30	16360	Schaeffer, L.	Genetic improvements of foot and leg disorders in dairy cattle.
<b>Immunogenetics</b>					
3	3.5	100	13430	Kaushik, A.	Comparative molecular analysis of immunoglobulin genes and construction of the immune system.
3	3.5	100	16470	Jacobs, R.	Identification of genomic virulence markers in bovine viral diarrhea virus (BVDV) type II.
3	3.5	65	18860	Mallard, B.	Genetic Regulation of Immune Responses During the Periparturient Period and Associations with Health and Performance of Holstein Cows.
<b>Decision Support Systems</b>					
4	4.1	100	13570	Lissemore, K.	A decision support system for the Ontario dairy industry.
<b>Reproductive Manage</b>					
5	5.1	100	15200	Walton, J.	Programmed breeding of dairy cows.
5	5.1	20	18770	Duffield, T.	Evaluation of Prevention, Treatment and Diagnostic Strategies for Retained Placenta and Metritis and their Subsequent Impact on Reproductive Performance in Lactating Dairy Cows.
5	5.1	100	18890	Peregrine, A.	Improved Diagnosis of Neosporosis in Ontario Dairy Cattle.

5	5.1	80	18910	Sharpe, P.	Metabolism and Fertility in dairy Cattle.
<b>Ovarian Function</b>					
5	5.2	50	15220	Hahnel, A.	Comparison of alkaline phosphatase gene expression in preattachment bovine embryos derived in vitro and in vivo in order to increase in vitro efficiencies.
5	5.2	100	16860	Gentry, P.	Function of proteinase-type proteins in regulation of ovarian follicular development in dairy cows.
<b>Obj.</b>	<b>Goal</b>	<b>%</b>	<b>Project #</b>	<b>Leader</b>	<b>Title</b>
<b>Sperm Physiology and Extension</b>					
5	5.3	60	18760	Buhr, M.	Predicting and Improving the Fertilizing Ability of Frozen-Thawed Bull Sperm.
<b>Assisted Reproductive Technologies</b>					
5	5.4	100	13420	Leibo, S.	The production of identical calves from isolated blastomeres, fetal germ cells or embryonic stem cells.
5	5.4	50	15520	Hahnel, A.	Comparison of alkaline phosphatase gene in preattachment bovine embryos derived in vitro and in vivo in order to increase in vitro efficiencies.
5	5.4	100	16280	Walton, J.	Endocrine regulation of early pregnancy in cattle.
5	5.4	100	16450	Morgan, J.	Health of calves produced from IVF/VM embryos: Effect on stillbirths, calving difficulty, perinatal-weaning mortality growth rate and disease incidence.
5	5.4	50	18780	Gentry, P.	Genetic Evaluation of Factor X1 Deficiency in Holsteins and its Association with Reduced Reproductive Efficiency.
<b>Sperm Cryobiology</b>					
5	5.5	100	16250	Leibo, S.	Derivation of an improved method to cryopreserve bull spermatozoa.
5	5.5	40	18760	Buhr, M.	Predicting and Improving the Fertilizing Ability of Frozen-Thawed Bull Sperm.
<b>Dairy Animal Comfort Calf</b>					

6	6.1	100	18750	Duncan, I.	The Effects of Tail Docking on the welfare of Dairy Cows.
6	6.1	100	18829	McKnight, D.	Feasibility of Using Screened Aged Bark for Animal Bedding.
<b>On-farm Dairy Waste Disposal/Milking Systems</b>					
6	6.2	100	16430	McKnight, D.	Sanitizing milk lines and milk handling equipment with special reference to rubber hoses, gaskets and inflations.
<b>Calf and Heifer Housing</b>					
6	6.3	100	16390	McKnight, D.	The effects of alternative hutch housing on performance of dairy calves.
6	6.3	100	16410	McKnight, D.	Investigation of installation, cost and durability of four manger surfaces in a tie-stall dairy barn.

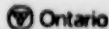
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